NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering

Vehicle Recorder Division

Washington, D.C. 20594

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

HWY22MH003

By

W. Deven Chen

WARNING

The reader of this report is cautioned that the transcription of a video recording is not a precise science but is the best product possible from a Safety Board group investigative effort. The transcript or parts thereof, if taken out of context, could be misleading. The transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information.

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division

June 22, 2022

Bus Surveillance Videos

Group Chairman's Factual Report
By W. Deven Chen

1. EVENT

Location:	Pittsburgh, Pennsylvania
Date:	January 28, 2022
Bridge:	Fern Hollow Bridge
NTSB Number:	HWY22MH003

2. GROUP

A video group was convened on March 16, 2022, at the National Transportation Safety Board's (NTSB) Vehicle Recorder Laboratory. The group consisted of the following members:

Chair:	Deven Chen Electrical Engineer NTSB
Member:	Kyle Garner Aerospace Engineer NTSB
Member:	Dennis Collins Investigator-in-Charge (IIC) NTSB
Member:	Justin Ocel Senior Structural Engineer Federal Highway Administration
Member:	Shawn Hudzinski Deputy Chief Port Authority of Allegheny County

Member:	Eric Setzler Chief Engineer City of Pittsburgh Department of Mobility and Infrastructure
Member:	Richard Runyen Assistant Chief Bridge Engineer Pennsylvania Department of Transportation

3. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division received seven video files recorded by seven surveillance cameras installed on the Port Authority bus traveling eastbound on the bridge when it collapsed. The video files were downloaded by non-NTSB personnel and forwarded via a secure file sharing service to the NTSB for review.

3.1. Video File Information

Among the seven surveillance cameras on the bus, one was forward-facing, one was curbside (right side aft-facing), and five were internal-facing. The five video files from the internal-facing cameras were deemed not pertinent to the investigation and are not discussed in the summary. The forwarding-facing and curbside video files were 30 minutes in duration each and in audio video interleave (AVI) format. None of the video files had audio. Metadata in the files indicated both the videos were recorded at a resolution of 352 x 240 pixels and a frame rate of 10 frames per second for the forward-facing video and a frame rate of 4 frames per second for the curbside video.

3.2. Timing and Correlation

According to the Port Authority, there was an offset between the timing shown on the videos and the local time, eastern standard time (EST). A unit within the surveillance camera system that could have provided GPS information to correct the time offset suffered a failure at some point prior to the bridge collapse, therefore, the timing could not be correlated to the local time, and the timestamps used in this report are expressed as device time cited from the videos. The proprietary video player software that came with the video files could only show the timestamps to the integer second. To timestamp different video frames within a same second with decimals, the videos were also viewed on a separate video player software (iNPUT-ACE).

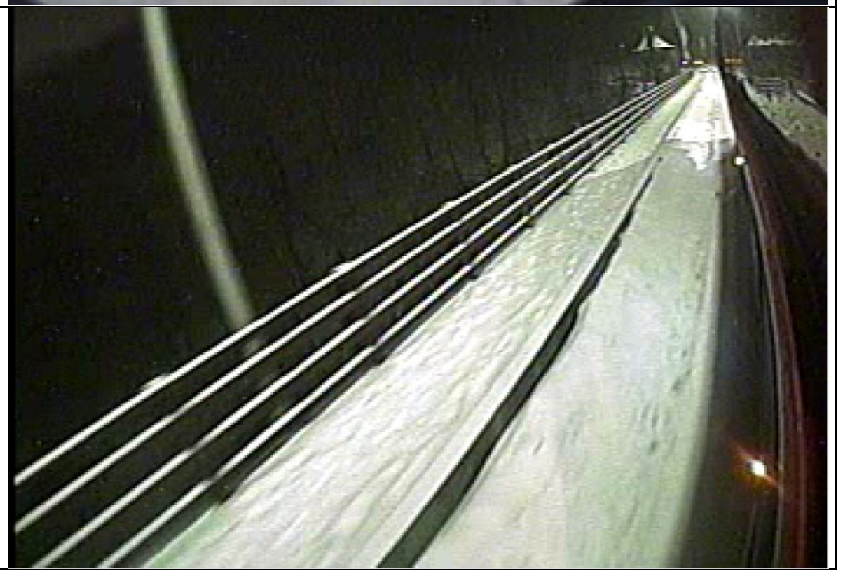
3.3. Summary of Recording Contents

The bus entered the bridge from the west end and traveled eastbound (left side of the images from the forward-facing camera is north, right side is south). The curbside camera was right side aft facing.

Camera/Device Time	Comment	Screenshot
6:15:00	Videos started.	
Forward-facing/6:27:22.966	The bus passed the intersection of South Dallas Avenue and Forbes Avenue. From this point forward, all westbound vehicles observed were passenger vehicles.	
Curbside/6:27:23-6:29:00.766	All vehicle traffic observed through this camera was westbound in this time period.	
Forward-facing/6:29:00.766	The west expansion joint was first visible. The snowfall from that day's storm event left a coating of up to one inch of snow on the roadway. There was hard pack snow from a previous event in the gutter. At this point, there were no eastbound vehicles observed ahead of the bus.	

Curbside/6:29:03.700	The stone house at the entrance of the bridge was first visible on the Curbside camera.	
Forward-facing/6:29:03.866	The front of the bus crossed the expansion joint.	

Curbside/6:29:03.966	The bridge's south railing was first visible. Lights visible behind the bus were the taillights of a westbound vehicle.	
Forward-facing/6:29:07.866	A westbound pick-up truck crossed onto the bridge. This was the only westbound vehicle observed on the bridge before the event occurred.	

Forward-facing/6:29:10.666	The front of the bus passed the light pole located in the middle of the bridge's south side. There were two other light poles located at each end of the bridge's south side.	
Curbside/6:29:11.433	The light pole located in the middle of the bridge's south side was first visible on the Curbside camera.	

Curbside/6:29:11.966	Observation of the bridge's south railing indicated the first visible vertical drop in the bridge. There are 3.5 post-spacings visible from the left extent of the image to the center light pole.	
Forward-facing/6:29:12.366	The camera view started to pitch up (corresponds to vertical drop of the bridge observed on the Curbside camera at 6:29:11.966).	

Curbside/6:29:13.033	In addition to vertical displacement, there appeared to be lateral displacement towards the north at bent 1. The railing in the foreground near bent 2 had started to break.	
Curbside/6:29:13.300	A puff of material along the curb line was observed which indicated that a hinge was forming in the deck. The railing had continued to break.	

Forward-facing/6:29:13.466	The Forward-facing camera view reached maximum vertical displacement comparing frame to frame starting at 6:29:12.366.	
Curbside/6:29:13.833	The west end of the bridge had visibly fallen off of the abutment.	

Forward-facing/6:29:14.066	The east expansion joint had visibly separated.	
Forward-facing/6:29:14.366	Changes in the top railing observed provided the first indication of vertical displacement at the east abutment of the bridge.	

Curbside/6:29:14.633	The center light pole went dark on the Curbside camera.	
Forward-facing/6:29:14.866	The light poles at the east end of the bridge went dark on the Forward-facing camera. The south side of the bridge had dropped more than the north side.	

Curbside/6:29:15.166	Another fracture of the deck was observed on the Curbside camera.	
Curbside/6:29:17.066	Another fracture of the deck occurred based on a debris cloud formed along the rail and the curb near the mid-length of the bus.	

Forward-facing/6:29:20.166	The bus came to rest and the camera view stabilized on the Forward-facing camera.	
Curbside/6:29:20.233	The bus came to rest and the camera view stabilized on the Curbside camera.	
6:45:00.000	The videos ended.	